



LC370WUH

Product Specification

SPECIFICATION FOR APPROVAL

() Preliminary Specification

(●) Final Specification

Title	37.0" WUXGA TFT LCD
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BUYER	General
LCM MODEL	LC370WUD-SBA1
SET MODEL	

SUPPLIER	LG Display Co., Ltd.
*MODEL	LC370WUH
SUFFIX	SBA1(RoHS Verified)

*When you obtain standard approval,
please use the above model name without suffix

APPROVED BY	SIGNATURE	DATE
/		
/		
/		

Please return 1 copy for your confirmation with
your signature and comments.

APPROVED BY	SIGNATURE	DATE
H.S.SONG /Team Leader		
REVIEWED BY		
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TV Product Development Dept.
LG Display Co., Ltd



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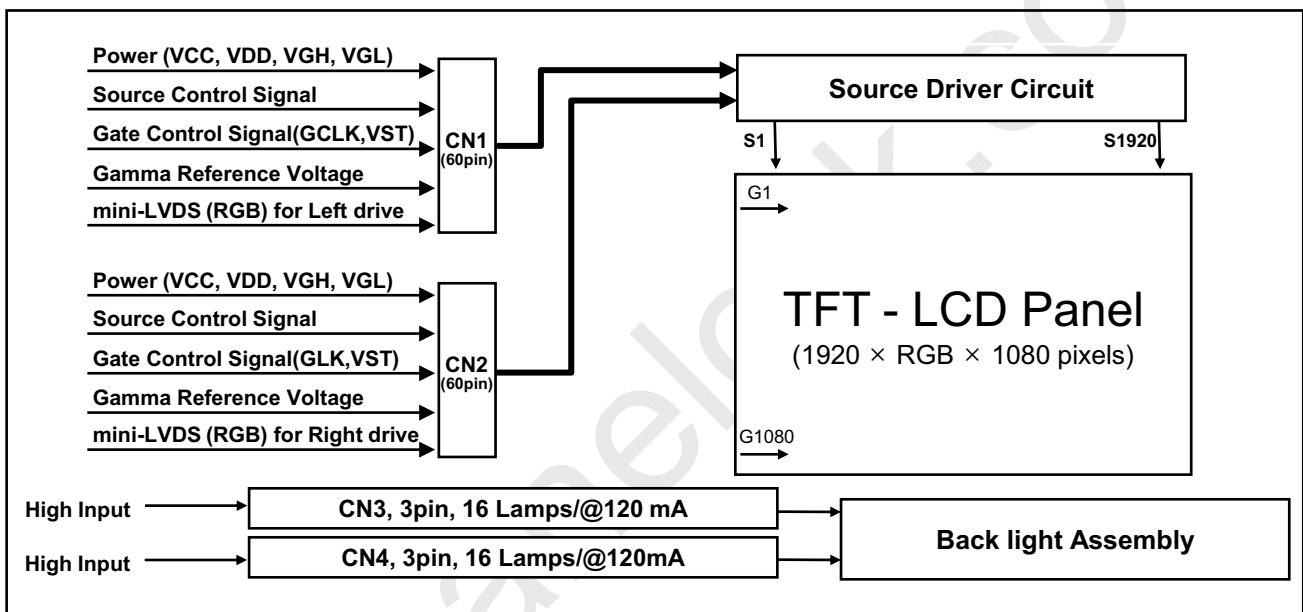
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1. General Description

The LC370WUH is a Color Active Matrix Liquid Crystal Display with an integral External Electrode Fluorescent Lamp(EEFL) backlight system. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive display type which is operating in the normally black mode. It has a 37 inch diagonally measured active display area with WUXGA resolution (1080 vertical by 1920 horizontal pixel array). Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arrayed in vertical stripes. Gray scale or the luminance of the sub-pixel color is determined with a 10-bit gray scale signal for each dot.

Therefore, it can present a palette of more than 1.06Billion (FRC) colors.

It is intended to support LCD TV, PCTV where high brightness, super wide viewing angle, high color gamut, high color depth and fast response time are important.



General Features

Active Screen Size	37 inches(940.091mm) diagonal
Outline Dimension	877(H) x 516.8 (V) x 36.4 mm(D) (Typ.)
Pixel Pitch	0.42675 mm x 0.42675 mm
Pixel Format	1920 horiz. by 1080 vert. Pixels, RGB stripe arrangement
Color Depth	System output : 8Bit → LCM output : 8Bit , 16.7M color System output : 10Bit(D) → LCM output : 10Bit , 1.06B color
Drive IC Data Interface	Source D-IC : 8-bit mini-LVDS, and control signals TTL Gate D-IC : GIP(Gate D-IC In Panel)
Luminance, White	500 cd/m ² (Center 1point ,Typ.)
Viewing Angle (CR>10)	Viewing angle free (R/L 178 (Typ.), U/D 178 (Typ.))
Power Consumption	Total 133.88W (Typ.) (Logic=8.88W, Back Light=125W with inverter,Control PCB)
Weight	7,400g (Typ.)
Display Mode	Transmissive mode, Normally black
Surface Treatment	Hard coating(3H), Anti-glare treatment of the front polarizer (Haze 10%)

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2. Absolute Maximum Ratings

The following items are maximum values which, if exceeded, may cause faulty operation or damage to the LCD module.

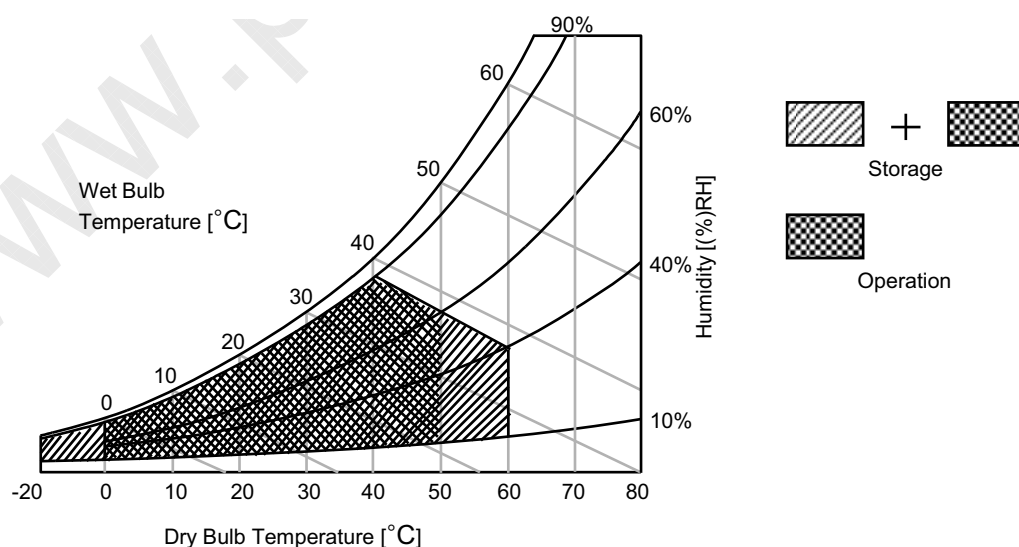
Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Value		Unit	Remark
			Min	Max		
Logic Power Voltage		VCC	-0.5	+4.0	VDC	at 25 ± 2 °C
Source D-IC Analog Voltage		VDD	-0.5	+20.0	VDC	
Gamma Ref. Voltage (Upper)		VGMH	½VDD-0.5	VDD+0.5	VDC	
Gamma Ref. Voltage (Low)		VGML	-0.5	½ VDD+0.5	VDC	
Gate High Voltage		VGH	-0.3	+40.0	VDC	
Gate Low Voltage		VGL	-14.0	+0.3	VDC	
Gate drive voltage difference		VGH-VGL	-0.3	+38.0	VDC	
B/L Input voltage	Operating Voltage (one side)	VOP	700	1100	V[RMS]	Note 1,2
Operating Temperature		TOP	0	+50	°C	
Storage Temperature		TST	-20	+60	°C	
Operating Ambient Humidity		HOP	10	90	%RH	
Storage Humidity		HST	10	90	%RH	

Note : 1. Temperature and relative humidity range are shown in the figure below.

Wet bulb temperature should be Max 39 °C. and no condensation of water.

2. Gravity mura can be guaranteed below 40 °C condition.





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3. Electrical Specifications

3-1. Electrical Characteristics

It requires two power inputs. One is employed to power for the LCD circuit. The other is used for the EEFL backlight circuit.

Table 2. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Condition	MIN	TYP	MAX	Units	Note
Logic Power Voltage	VCC	-	3.0	3.3	3.6	V	
Logic High Level Input Voltage	V _{IH}		2.3		VCC	V	
Logic Low Level Input Voltage	V _{IL}		0		0.8	V	
Source D-IC Analog Voltage	VDD	-	-	16.3	-	V	
Gamma Reference Voltage	V _{GMH}	V _{GMA} (GMA1 ~ GMA9)	½*VDD		VDD-0.2	V	
	V _{GML}	V _{GMA} (GMA10 ~ GMA18)	0.2		½*VDD	V	
Common Voltage	V _{com}	-	6.11	6.86	8.14	V	
Clock frequency	CLK	3.0V≤VCC≤3.6V	250		315	MHz	
mini-LVDS input Voltage (Center)	V _{IB}	Clock and Data	0.7 + (VID/4)		(VCC-1.2) - VID /4	V	
mini-LVDS input Voltage Distortion(Center)	△V _{IB}		-	-	0.7	V	5,6
mini-LVDS differential Voltage range	V _{ID}		0.35		1.3	V(p-p)	5.6
mini-LVDS differential Voltage range Dip	△V _{ID}		0.1		1.3	V	
Gate High Voltage	V _{GH}	-	24.8	25.3	25.8	VDC	Fig1
Gate Low Voltage	V _{GL}	-	-7.1	-7.5	-7.9	VDC	Fig1
VLCD Power Current	I _{LCD}	-		740	962	mA	1,2
VLCD Power Consumption	P _{LCD}	-		8.88	11.54	Watt	1,2

Notes : 1. The specified current and power consumption are under the V_{LCD}=12V., 25 ± 2°C, f_v=120Hz condition whereas mosaic pattern(8 x 6) is displayed and f_v is the frame frequency.

2. The above spec is general value in Base model.
3. All of the typical gate voltage require to control within 1% voltage level
4. Ripple voltage is recommended under 10% level
5. See Fig 2 for the more detailed definition.
6. The above spec will be guaranteed when measure specific point at Fig3.

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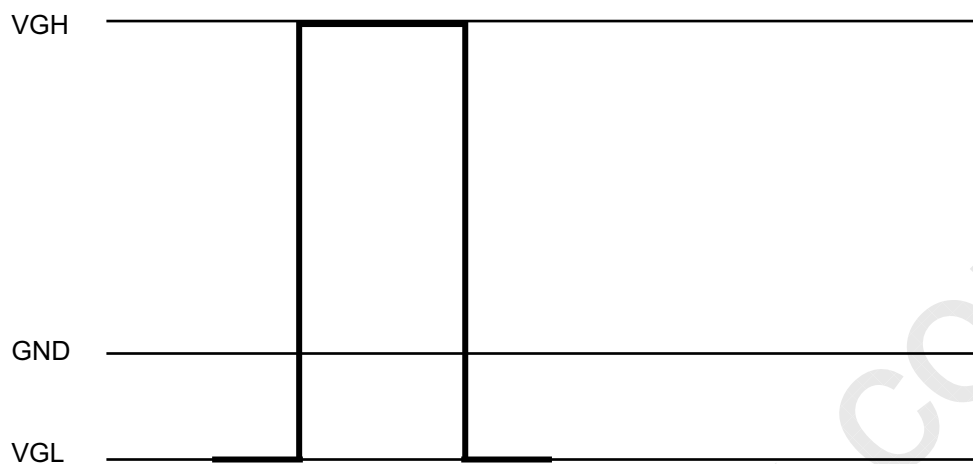
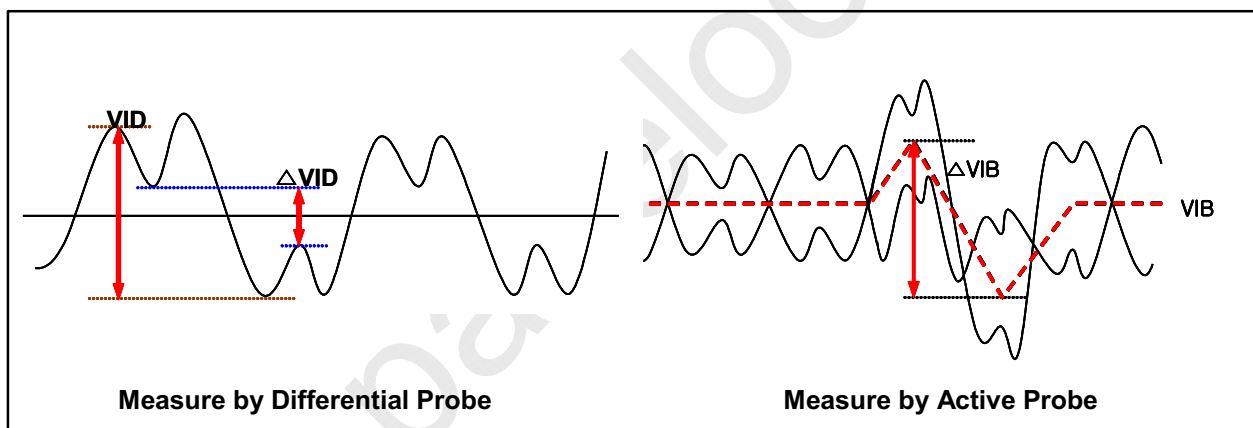


FIG. 1 Gate Output Wave form

FIG. 2 Description of VID, VIB, ΔVID , ΔVIB

* Source PCB

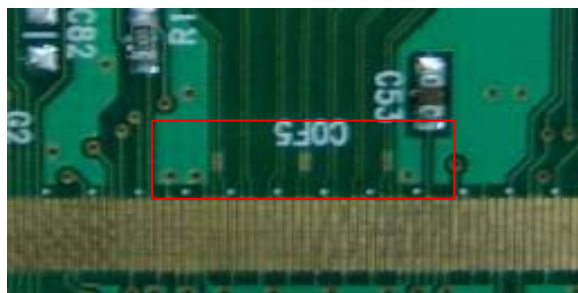


FIG. 3 Measure point

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Table 3. ELECTRICAL CHARACTERISTICS of Back Light Assembly & Lamp (Continue)

Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
Backlight Assembly :							
Operating Voltage (one side,fBL=45KHz, IBL= 120mA _{Arms})		VBL	850	980	1150	V _{RMS}	1, 2
Operating Current (one side)		IBL	108	120	132	mA _{RMS}	1
Established Starting Voltage (one side)	0℃	Vs	-	-	1120	V _{RMS}	1, 3
	25℃		-	-	960		
Operating Frequency		fBL	43	45	47	kHz	4
Striking Time		S TIME	-	-	1.5	sec	3
Power Consumption		PBL		125		Watt	6
Burst Dimming Duty		{ a/T } * 100	20		100	%	9
Burst Dimming Frequency		1/T	95	-	182	Hz	9

Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
Lamp : APPENDIX-V							
Lamp Voltage (one side)		VLAMP	802	1082	1130	V _{RMS}	2
Lamp Current (one side)		ILAMP	3.5	7.5	8.5	mA _{RMS}	
Discharge Stabilization Time		TS	-	-	3	Min	5
Lamp Frequency		f LAMP	40	45	80	KHz	
Lamp Temperature		TLAMP			130	°C	
Established Starting Voltage (one side)	0 °C	Vs			1120	V _{RMS}	3
	25 °C	Vs			960		
Life Time			50,000			Hrs	7

Notes : The design of the inverter must have specifications for the lamp in LCD Assembly.

The electrical characteristics of inverter are based on High-High Driving type.

The performance of the lamps in LCM, for example life time or brightness, is extremely influenced by the characteristics of the DC-AC inverter. So, all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter.

When you design or order the inverter, please make sure unwanted lighting caused by the mismatch of the lamp and the inverter (no lighting, flicker, etc) has never been occurred. When you confirm it, the LCD- Assembly should be operated in the same condition as installed in your instrument.

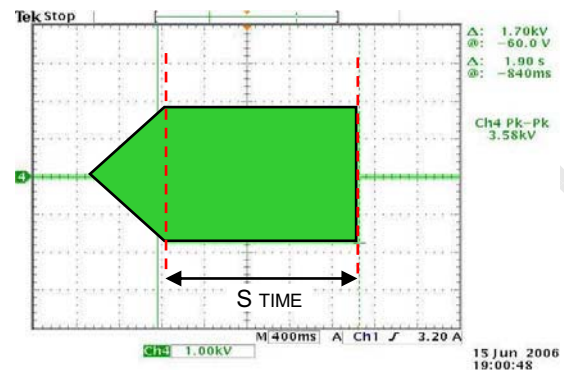
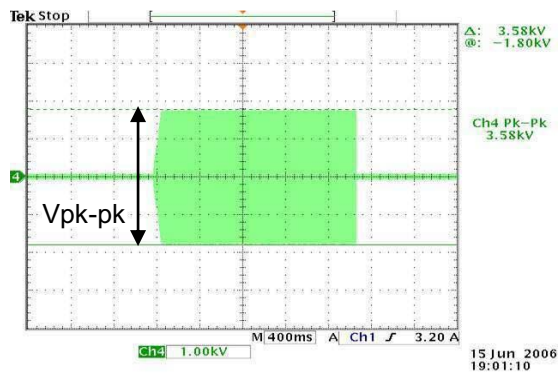
※ Do not attach a conductive tape to lamp connecting wire.

If you attach conductive tape to the lamp wire, not only luminance level can be lower than typical one but also inverter operate abnormally on account of leakage current which is generated between lamp wire and conductive tape.

- Specified values are defined for a Backlight Assembly.(IBL : 16 lamp, 7.5mA/Lamp)
- Operating voltage is measured at $25 \pm 2^\circ\text{C}$ (after 2hr.aging). The variance range for operating voltage is $\pm 10\%$.
- The established starting voltage [Vs] should be applied to the lamps for more than Striking time (S TIME) for start-up. Inverter open voltage must be more than established starting voltage. Otherwise, the lamps may not be turned on. The used lamp current is typical value.

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$$V_s = (V_{pk-pk}) / [2 \cdot \sqrt{2}]$$

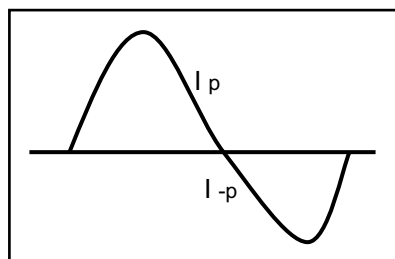
4. Lamp frequency may produce interference with horizontal synchronous frequency. As a result, the may cause beat on the display. Therefore, lamp frequency shall be away as much as possible from the horizontal synchronous frequency and its harmonics range in order to prevent interference.
5. The brightness of the lamp after lighted for 5minutes is defined as 100%.
 T_s is the time required for the brightness of the center of the lamp to be not less than 95% at typical current.
 The screen of LCD module may be partially dark by the time the brightness of lamp is stable after turn on.
6. Maximum level of power consumption is measured at initial turn on.
 Typical level of power consumption is measured after 2hrs aging at $25 \pm 2^\circ\text{C}$.
7. The life time is determined as the time at which brightness of the lamp is 50% compared to that of initial value at the typical lamp current on condition of continuous operating at $25 \pm 2^\circ\text{C}$, based on duty 100%.
8. The output of the inverter must have symmetrical(negative and positive) voltage and current waveform (Unsymmetrical ratio is less than 10%). Please do not use the inverter which has not only unsymmetrical voltage and current but also spike wave.

Requirements for a system inverter design, which is intended to achieve better display performance, power efficiency and more reliable lamp characteristics.

It can help increase the lamp lifetime and reduce leakage current.

- a. The asymmetry rate of the inverter waveform should be less than 10%.
- b. The distortion rate of the waveform should be within $\sqrt{2} \pm 10\%$.

* Inverter output waveform had better be more similar to ideal sine wave.



* Asymmetry rate:

$$|I_p - I_{-p}| / I_{op} \times 100\%$$

* Distortion rate

$$I_p \text{ (or } I_{-p}) / I_{op}$$

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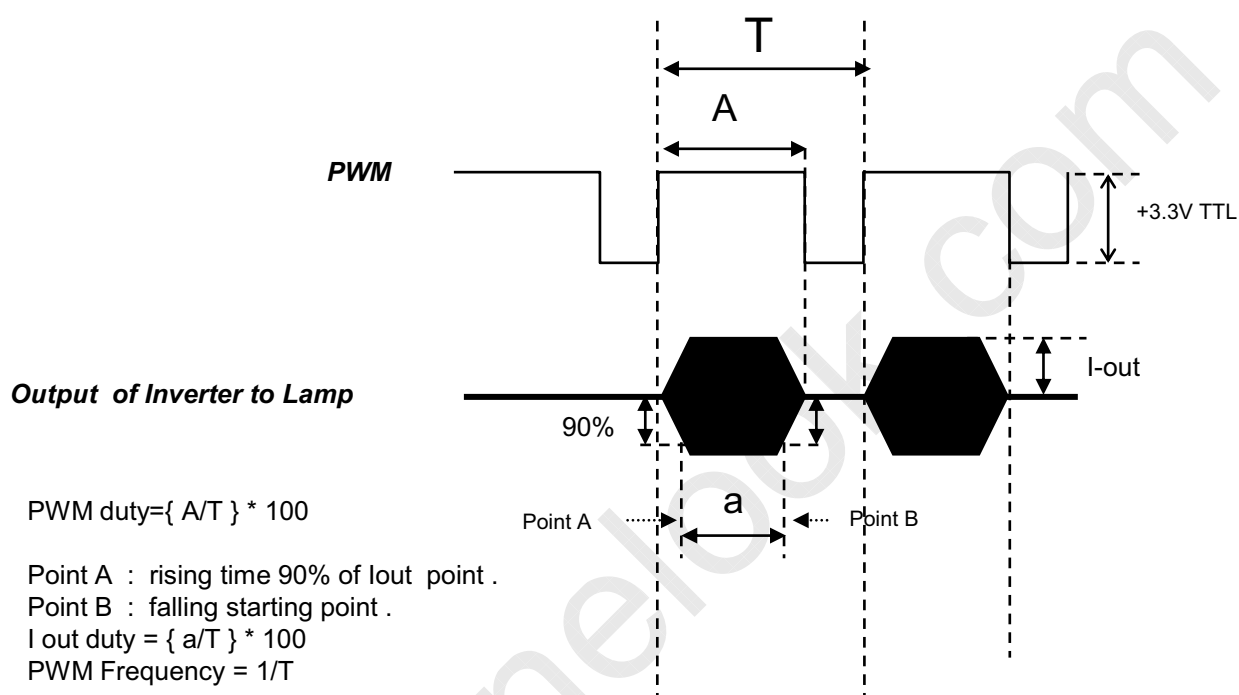
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9. The reference method of burst dimming duty ratio.

It is recommended to use synchronous V-sync frequency to prevent waterfall

(Vsync x 1 =Burst Frequency)

Though PWM frequency is over 182Hz(max252Hz), function of lamp is not affected



※ We recommend not to be much different between PWM duty and Iout duty .

※ Dimming current output rising and falling time may produce humming and inverter trans' sound noise.

※ Burst dimming duty should be 100% for more than 1second after turn on.

※ Equipment

Oscilloscope : TDS3054B(Tektronix)

Current Probe : P6022 AC (Tektronix)

High Voltage Probe: P5100(Tektronix)

10. The Cable between the backlight connector and its inverter power supply should be connected directly with a minimized length. The longer cable between the backlight and the inverter may cause the lower luminance of lamp and may require more higher starting voltage (Vs).

11. The operating current must be measured as near as backlight assembly input.

12. The operating current unbalance between left and right must be under 10% of Typical current

$| \text{Left(Master) current} - \text{Right(Slave) Current} | < 10\% \text{ of typical current}$



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3-2. Interface Connections

This LCD module employs two 60pin connector of interface connection, Each 60 pin connectors are used for the module electronics and two 3-pin Balance PCB connectors are used for the integral backlight system.

3-2-1. LCD Module

- LCD Connector : AF7601-N2G11 (Manufactured by P-TWO or Equivalent)

Table 4-1. Source PCB CONNECTOR(CN1) PIN CONFIGURATION

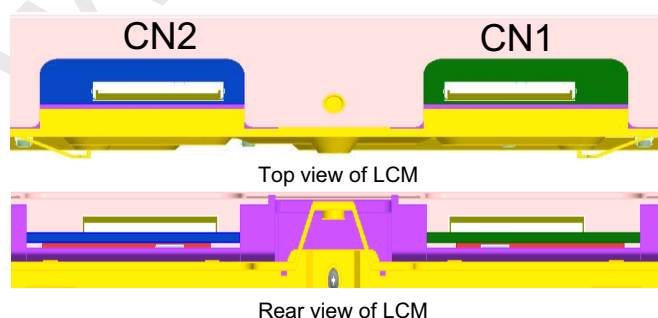
No	Symbol	Description	No	Symbol	Description
1	GND	Ground	31	NC	No Connection
2	LTD_OUT	LTD OUTPUT	32	LV2B	Left Mini LVDS Receiver Signal(2-)
3	GND	Ground	33	LV2A	Left Mini LVDS Receiver Signal(2+)
4	VDD	DRIVER POWER SUPPLY VOLTAGE	34	LV1B	Left Mini LVDS Receiver Signal(1-)
5	VDD	DRIVER POWER SUPPLY VOLTAGE	35	LV1A	Left Mini LVDS Receiver Signal(1+)
6	GND	Ground	36	LV0B	Left Mini LVDS Receiver Signal(0-)
7	VCC	LOGIC POWER SUPPLY VOLTAGE	37	LV0A	Left Mini LVDS Receiver Signal(0+)
8	VCC	LOGIC POWER SUPPLY VOLTAGE	38	GND	Ground
9	GND	Ground	39	SOE	LEFT SOURE OUTPUT ENABLE
10	V18_B	GAMMA VOLTAGE 18	40	POL	POLARITY OUTPUT SIGNAL
11	V16	GAMMA VOLTAGE 16	41	V9	GAMMA VOLTAGE 9
12	V15	GAMMA VOLTAGE 15	42	V7	GAMMA VOLTAGE 7
13	V13	GAMMA VOLTAGE 13	43	V6	GAMMA VOLTAGE 6
14	V12	GAMMA VOLTAGE 12	44	V4	GAMMA VOLTAGE 4
15	V10	GAMMA VOLTAGE 10	45	V3	GAMMA VOLTAGE 3
16	GSP	GATE START PULSE	46	V1_B	GAMMA VOLTAGE 1
17	H_CONV	HORIZONTAL 2 INVERSION SIGNAL	47	VCOMIN	LEFT VCOM OUTPUT
18	CHRSR	CHARGE SHARING CONTROL SIGNAL	48	VCOMFB	LEFT VCOM FEEDBACK
19	GND	Ground	49	VST	GATE START PULSE FOR GIP
20	NC	No Connection	50	VSS (VGL)	GATE LOW VOLTAGE FOR GIP
21	NC	No Connection	51	VDD_EVEN	DISCHARGING VOLTAGE EVEN FOR GIP
22	LV6B	Left Mini LVDS Receiver Signal(6-)	52	VDD_ODD	DISCHARGING VOLTAGE ODD FOR GIP
23	LV6A	Left Mini LVDS Receiver Signal(6+)	53	VDD (VGH)	GATE HIGH VOLTAGE FOR GIP
24	LV5B	Left Mini LVDS Receiver Signal(5-)	54	CLK6	GATE SHIFT CLOCK6 FOR GIP
25	LV5A	Left Mini LVDS Receiver Signal(5+)	55	CLK5	GATE SHIFT CLOCK5 FOR GIP
26	LV4B	Left Mini LVDS Receiver Signal(4-)	56	CLK4	GATE SHIFT CLOCK4 FOR GIP
27	LV4A	Left Mini LVDS Receiver Signal(4+)	57	CLK3	GATE SHIFT CLOCK3 FOR GIP
28	CLKB	Left Mini LVDS Receiver Clock Signal(-)	58	CLK2	GATE SHIFT CLOCK2 FOR GIP
29	CLKA	Left Mini LVDS Receiver Clock Signal(+)	59	CLK1	GATE SHIFT CLOCK1 FOR GIP
30	NC	No Connection	60	GND	Ground

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Table 4-2. Source PCB CONNECTOR (CN2) PIN CONFIGURATION

No	Symbol	Description	No	Symbol	Description
1	GND	Ground	31	LV2A	Right Mini LVDS Receiver Signal(2+)
2	LTD_OUT	LTD OUTPUT	32	LV1B	Right Mini LVDS Receiver Signal(1-)
3	GND	Ground	33	LV1A	Right Mini LVDS Receiver Signal(1+)
4	VDD	DRIVER POWER SUPPLY VOLTAGE	34	LV0B	Right Mini LVDS Receiver Signal(0-)
5	VDD	DRIVER POWER SUPPLY VOLTAGE	35	LV0A	Right Mini LVDS Receiver Signal(0+)
6	GND	Ground	36	GND	Ground
7	VCC	LOGIC POWER SUPPLY VOLTAGE	37	SOE	RIGHT SOURE OUTPUT ENABLE
8	VCC	LOGIC POWER SUPPLY VOLTAGE	38	POL	POLARITY OUTPUT SIGNAL
9	GND	Ground	39	GSP	GATE START PULSE
10	V18_B	GAMMA VOLTAGE 18	40	H_CONV	HORIZONTAL 2 INVERSION SIGNAL
11	V16	GAMMA VOLTAGE 16	41	V9	GAMMA VOLTAGE 9
12	V15	GAMMA VOLTAGE 15	42	V7	GAMMA VOLTAGE 7
13	V13	GAMMA VOLTAGE 13	43	V6	GAMMA VOLTAGE 6
14	V12	GAMMA VOLTAGE 12	44	V4	GAMMA VOLTAGE 4
15	V10	GAMMA VOLTAGE 10	45	V3	GAMMA VOLTAGE 3
16	CHRSHR	CHARGE SHARING CONTROL SIGNAL	46	V1_B	GAMMA VOLTAGE 1
17	GND	Ground	47	GND	Ground
18	NC	No Connection	48	CLK6	GATE SHIFT CLOCK6 FOR GIP
19	NC	No Connection	49	CLK5	GATE SHIFT CLOCK5 FOR GIP
20	LV6B	Right Mini LVDS Receiver Signal(6-)	50	CLK4	GATE SHIFT CLOCK4 FOR GIP
21	LV6A	Right Mini LVDS Receiver Signal(6+)	51	CLK3	GATE SHIFT CLOCK3 FOR GIP
22	LV5B	Right Mini LVDS Receiver Signal(5-)	52	CLK2	GATE SHIFT CLOCK2 FOR GIP
23	LV5A	Right Mini LVDS Receiver Signal(5+)	53	CLK1	GATE SHIFT CLOCK1 FOR GIP
24	LV4B	Right Mini LVDS Receiver Signal(4-)	54	VDD (VGH)	GATE HIGH VOLTAGE FOR GIP
25	LV4A	Right Mini LVDS Receiver Signal(4+)	55	VDD_ODD	DISCHARGING VOLTAGE ODD FOR GIP
26	CLKB	Right Mini LVDS Receiver Clock(-)	56	VDD_EVEN	DISCHARGING VOLTAGE EVEN FOR GIP
27	CLKA	Right Mini LVDS Receiver Clock (+)	57	VSS (VGL)	GATE LOW VOLTAGE FOR GIP
28	NC	No Connection	58	VST	GATE START PULSE FOR GIP
29	NC	No Connection	59	VCOMIN	RIGHT VCOM OUTPUT
30	LV2B	Right Mini LVDS Receiver Signal(2-)	60	GND	Ground



[CN1]
- Part/No. : AF7601-N2G11(P-TWO)

[CN2]
- Part/No. : AF7601-N2G11(P-TWO)

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3-2-2. Backlight Inverter

[Master]

1) Balance Connector

: 65002WS-03 (manufactured by YEONHO) or equivalent

2) Mating Connector

: 65002HS-03 (manufactured by YEONHO) or equivalent.

[Slave]

1) Balance Connector

: 65002WS-03 (manufactured by YEONHO) or equivalent

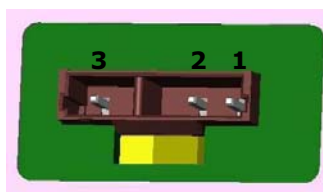
2) Mating Connector

: 65002HS-03 (manufactured by YEONHO) or equivalent.

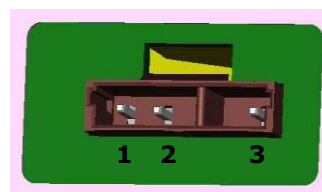
Table 5. BACKLIGHT CONNECTOR PIN CONFIGURATION(CN2,CN3)

No	Symbol	Master	Slave	Note
1	H_Input	High_Input	High_Input	
2	H_Input	High_Input	High_Input	
3	FB	NC	NC	

◆ Rear view of LCM



Master



Slave

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3-3. Signal Timing Specifications

TABLE 6. Timing Requirements

Parameter	Symbol	Condition	Min	Typ	Max	Units
Data clock frequency (Note 1)	t1	3.0<VCC<3.6			330	MHz
Clock pulse low period (Note 1)	t2	3.0<VCC<3.6	1.35	-	-	ns
Clock pulse high period (Note 1)	t3	3.0<VCC<3.6	1.35	-	-	ns
Data setup time (Note 1)	t4	3.0<VCC<3.6	0.65	-	-	ns
Data hold time (Note 1)	t5		0.65	-	-	ns
Reset low to SOE rising time	t6		0	-	-	ns
SOE to Reset input time	t7		150	-	-	ns
Receiver off to SOE timing	t8		9	-	-	DCLK
POL signal SOE setup time	t9		-5	-	-	ns
POL signal SOE hold time	t10		6	-	-	ns
Reset High Period	t11		Over 3 CLK	-	-	-
SOE signal GSP setup time	t12		6'CLK	-	-	-

Notes :

1. Setup time and hold time couldn't be satisfied at the same time

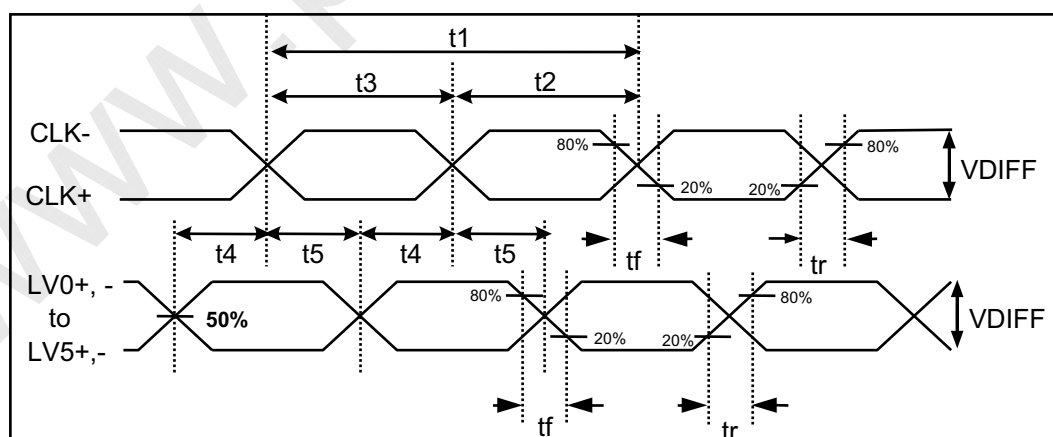


FIG 2. Clock Timing Waveform

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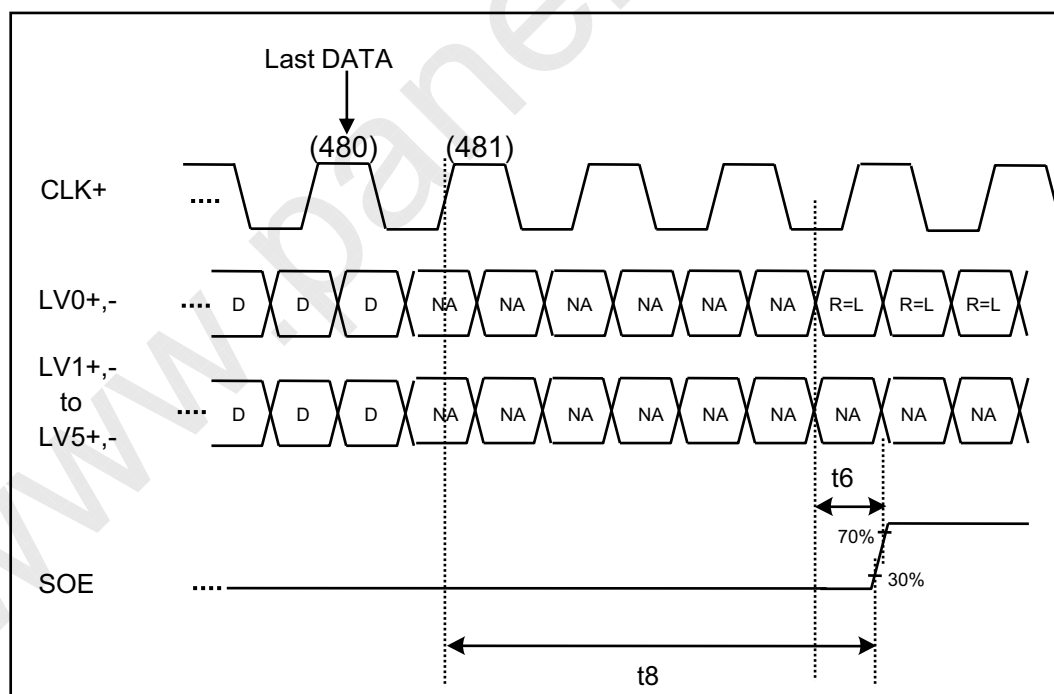
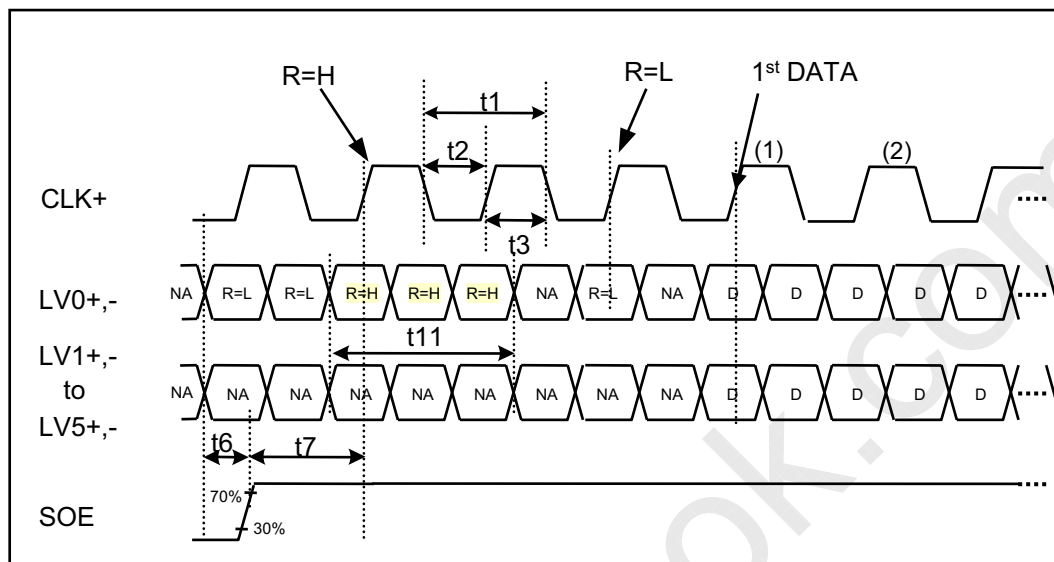


FIG 3. Clock and SOE Timing Waveform

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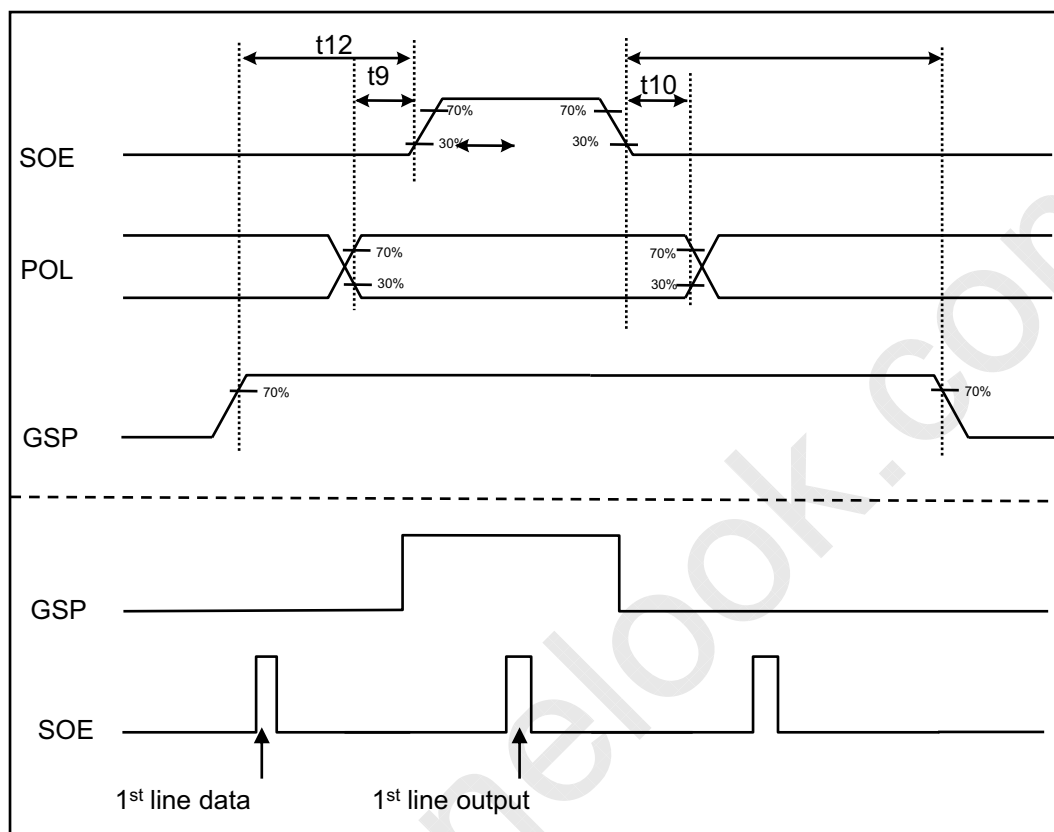


FIG 4. POL, GSP and SOE Timing Waveform

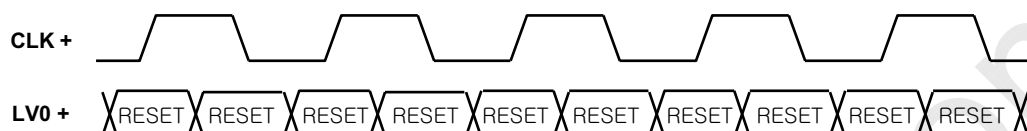
LC370WUH

Product Specification

3-4. Data Mapping and Timing

Display data and control signal (RESET) are input to LV0 to LV7. Data mapping is changed in response to mode, and the mode is changed by mode.

3-4-1. Control signal input mode



3-4-2. Display data input mode

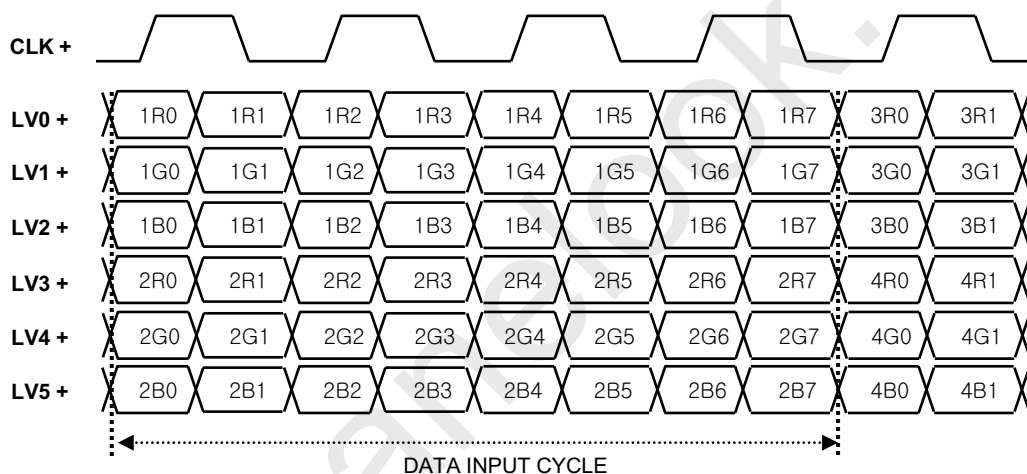


Fig. 5 Left mini-LVDS Data

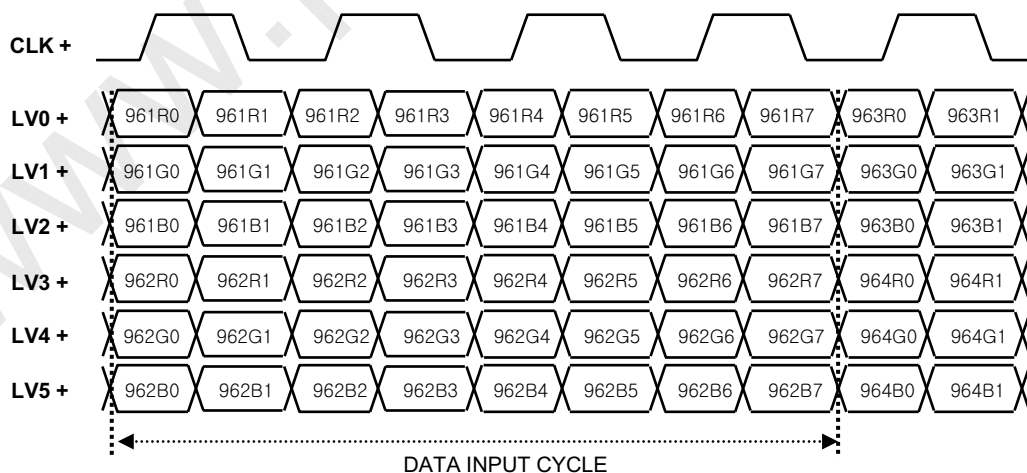


Fig. 6 Right mini-LVDS Data

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Product Specification

3-5. Panel Pixel Structure

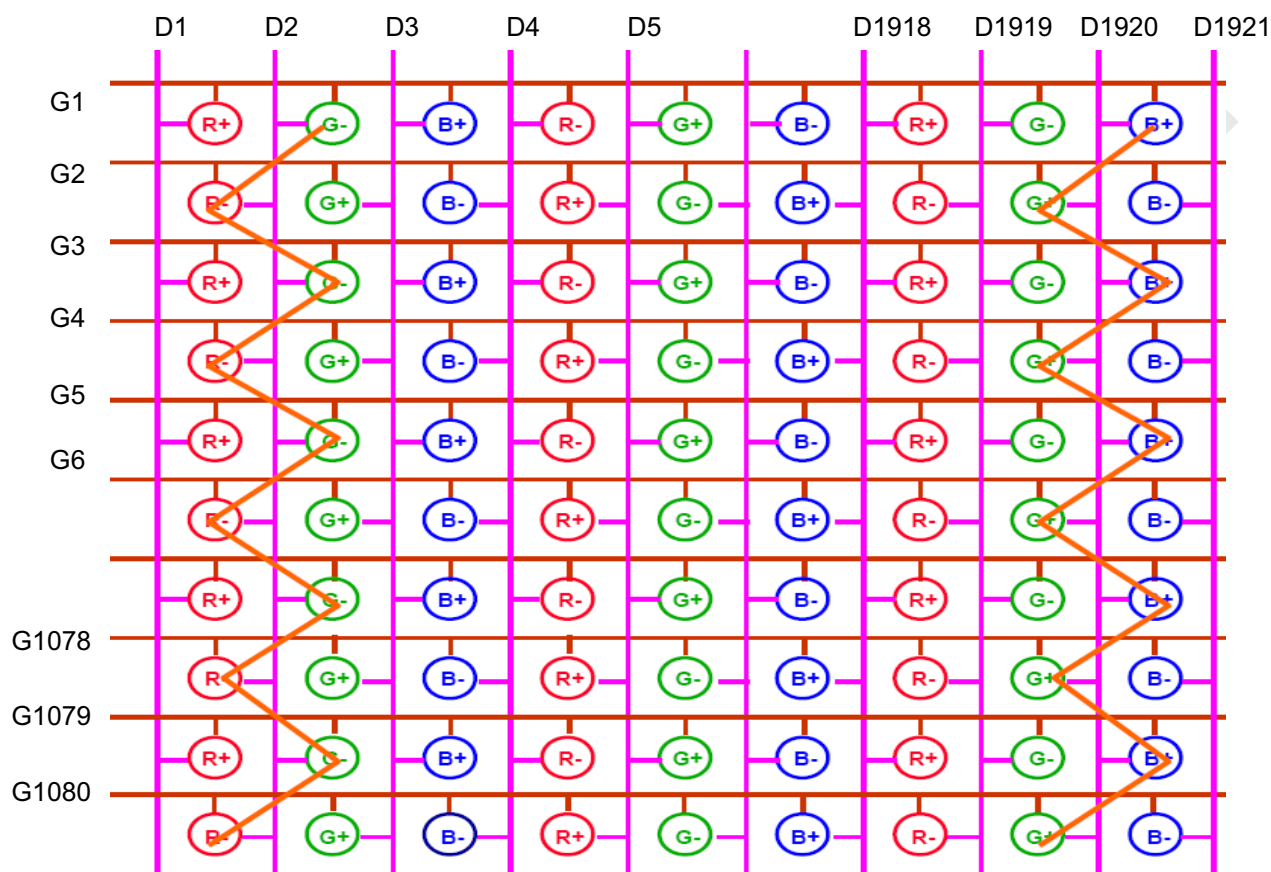


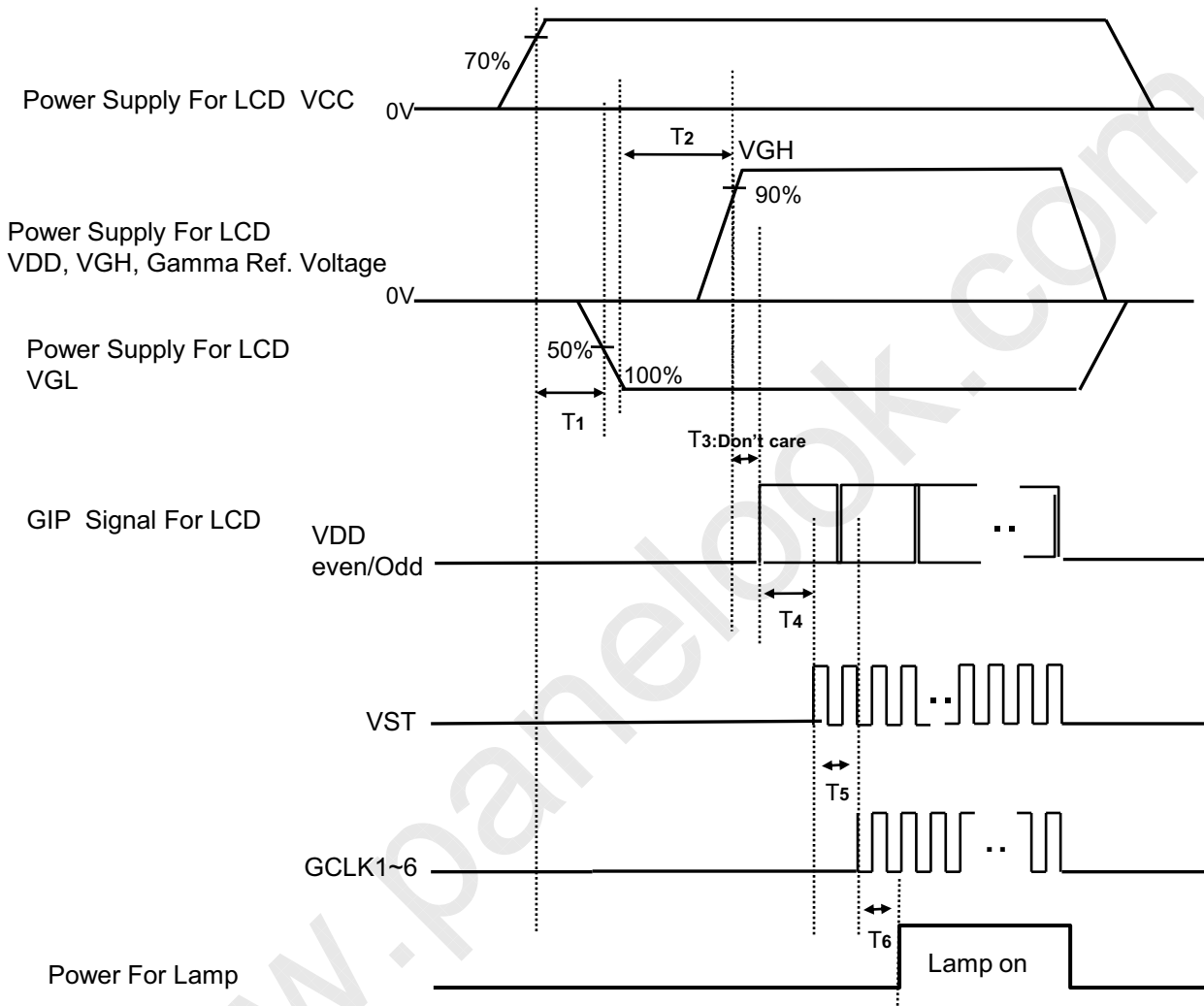
FIG. 7 Panel Pixel Structure

LC370WUH

Product Specification

3-6. Power Sequence

3-6-1. LCD Driving circuit

**Table 7. POWER SEQUENCE**

Ta= 25±2°C, fv=120Hz, Dclk=297MHz, fH=135kHz

Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	0.5		-	ms	
T2	0.5		-	ms	
T4	20(2~3frame)		-	ms	4
T5	20(2~3frame)		-	ms	
T6	20		-	ms	

Note : 1. The Source D-IC power on sequence must be VCC, logic input, VDD & Gamma ref. voltage.
2. GIP specific timing setting is refer to Appendix I
3. VDD Odd signal should be started "High" status.

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Product Specification

4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable in a dark environment at $25 \pm 2^\circ\text{C}$. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0° .

FIG. 8 shows additional information concerning the measurement equipment and method.

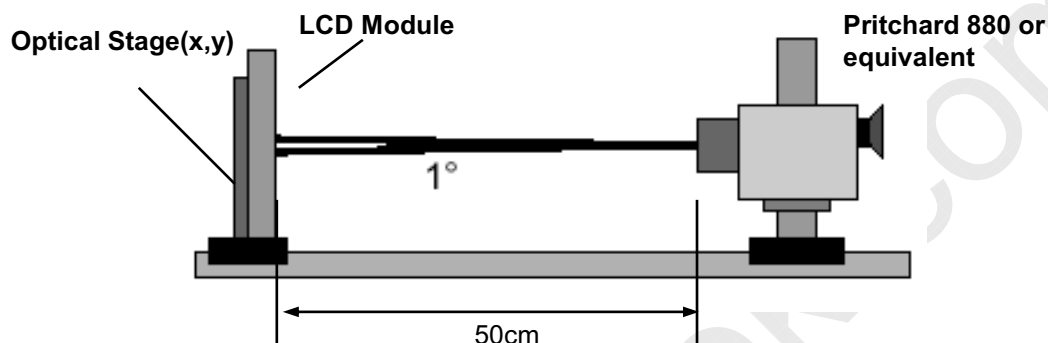


FIG. 8 Optical Characteristic Measurement Equipment and Method

$T_a = 25 \pm 2^\circ\text{C}$, $V_{\text{LCD}} = 12.0\text{V}$, $f_v = 120\text{Hz}$, $D_{\text{clk}} = 297\text{MHz}$
 $\text{IBL} = 120\text{mA}$

Table 7. OPTICAL CHARACTERISTICS

Parameter		Symbol	Value			Unit	Note
			Min	Typ	Max		
Contrast Ratio		CR	1000	1400	-		1
Surface Luminance, white		L_{WH}	400	500		cd/m^2	2
Uniformity							
Response Time	Rising	T_r	-	8	12	ms	4
	Falling	T_f	-	8	12	ms	4
Color Coordinates [CIE1931]	RED	R_x	Typ -0.03	0.639	Typ +0.03		
		R_y		0.334			
	GREEN	G_x		0.289			
		G_y		0.606			
	BLUE	B_x		0.145			
		B_y		0.065			
	WHITE	W_x		0.279			
		W_y		0.292			
Viewing Angle (CR>10)							
	x axis, right($\phi=0^\circ$)	θ_r	89	-	-	degree	5
	x axis, left ($\phi=180^\circ$)	θ_l	89	-	-		
	y axis, up ($\phi=90^\circ$)	θ_u	89	-	-		
	y axis, down ($\phi=270^\circ$)	θ_d	89	-	-		
Gray Scale				-			6



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Product Specification

Notes :1Contrast Ratio(CR) is defined mathematically as :

$$CR = \frac{\text{Surface Luminance at all white pixels}}{\text{Surface Luminance at all black pixels}}$$

It is measured at center 1-point.

- Surface luminance is determined after the unit has been 'ON' and 1Hour after lighting the backlight in a dark environment at $25 \pm 2^\circ\text{C}$. Surface luminance is the luminance value at center 1-point across the LCD surface 50cm from the surface with all pixels displaying white. For more information see the FIG. 9.
- The variation in surface luminance , δ WHITE is defined as :

$$\delta \text{ WHITE}(5P) = \text{Maximum}(L_{on1}, L_{on2}, L_{on3}, L_{on4}, L_{on5}) / \text{Minimum}(L_{on1}, L_{on2}, L_{on3}, L_{on4}, L_{on5})$$
 Where L_{on1} to L_{on5} are the luminance with all pixels displaying white at 5 locations .
 For more information, see the FIG. 9.
- Response time is the time required for the display to transit from G(255) to G(0) (Rise Time, Tr_R) and from G(0) to G(255) (Decay Time, Tr_D).
 ※ Photo Detector : RD-80S / Field : 2°
- Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD module surface. For more information, see the FIG. 11.
- Gray scale specification
 Gamma Value is approximately 2.2. For more information, see the Table 8.

Table 8. GRAY SCALE SPECIFICATION

Gray Level	Luminance [%] (Typ.)		Gray Level	Gamma Ref.
L0	0.07	Positive Voltage	L0	Gamma9
L63	0.24		L1	-
L127	1.04		L31	Gamma7
L191	2.49		L63	Gamma6
L255	4.68		L127	-
L319	7.66		L191	Gamma4
L383	11.5		L223	Gamma3
L447	16.1		L255	Gamma1
L511	21.6	Negative Voltage	L255	Gamma18
L575	28.1		L223	Gamma16
L639	35.4		L191	Gamma15
L703	43.7		L127	-
L767	53.0		L63	Gamma13
L831	63.2		L31	Gamma12
L895	74.5		L1	-
L959	86.7		L0	Gamma10
L1023	100			

LC370WUH

Product Specification

Measuring point for surface luminance & measuring point for luminance variation.

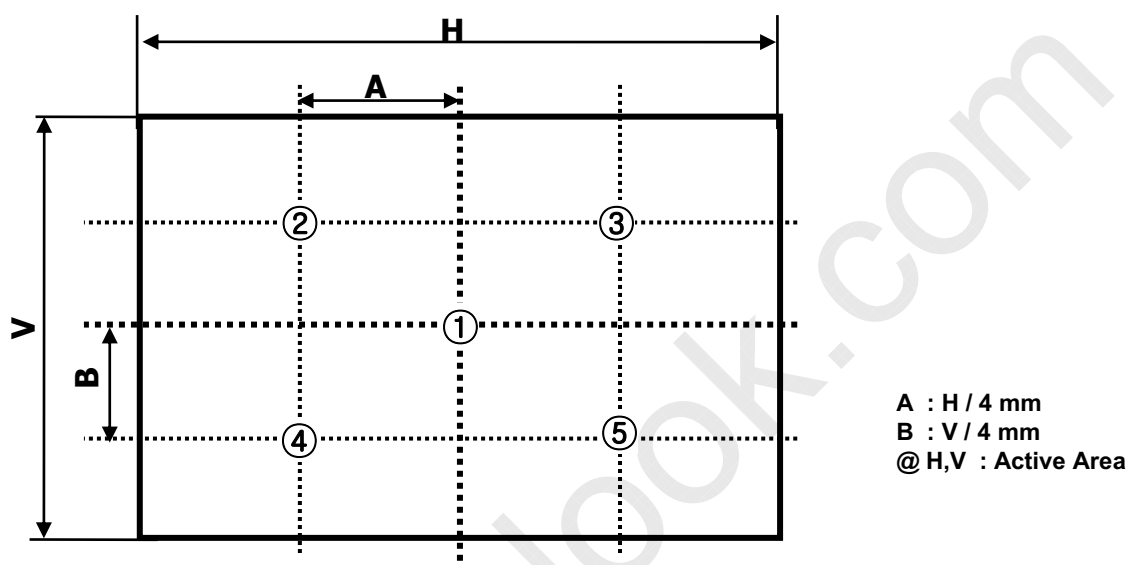


FIG. 9 5 Points for Luminance Measure

Response time is defined as the following figure and shall be measured by switching the input signal for "Gray(N)" and "Gray(M)".

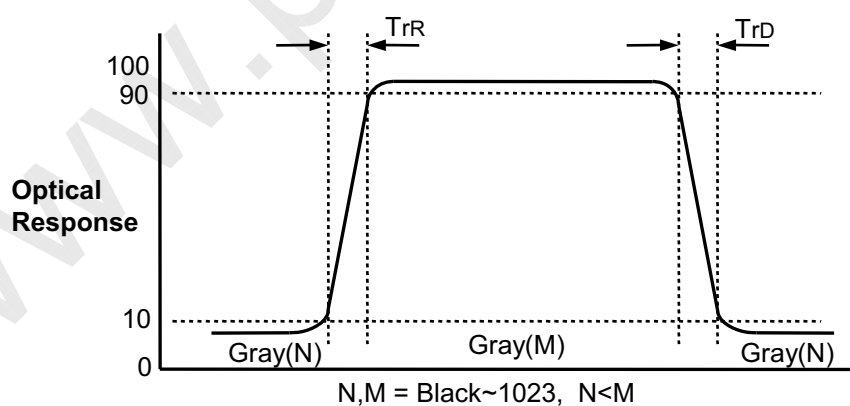


FIG.10 Response Time(G to G)

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Product Specification

Dimension of viewing angle range

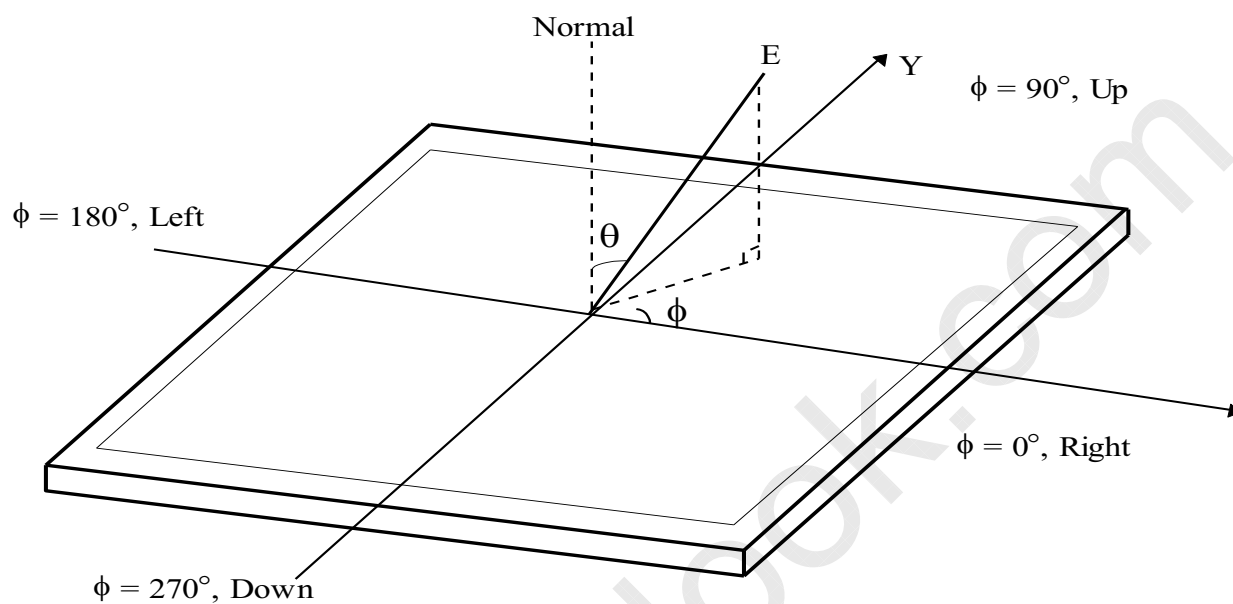


FIG. 11 Viewing angle



LC370WUH

Product Specification

5. Mechanical Characteristics

Table 9 provides general mechanical characteristics.

Table 9. MECHANICAL CHARACTERISTICS

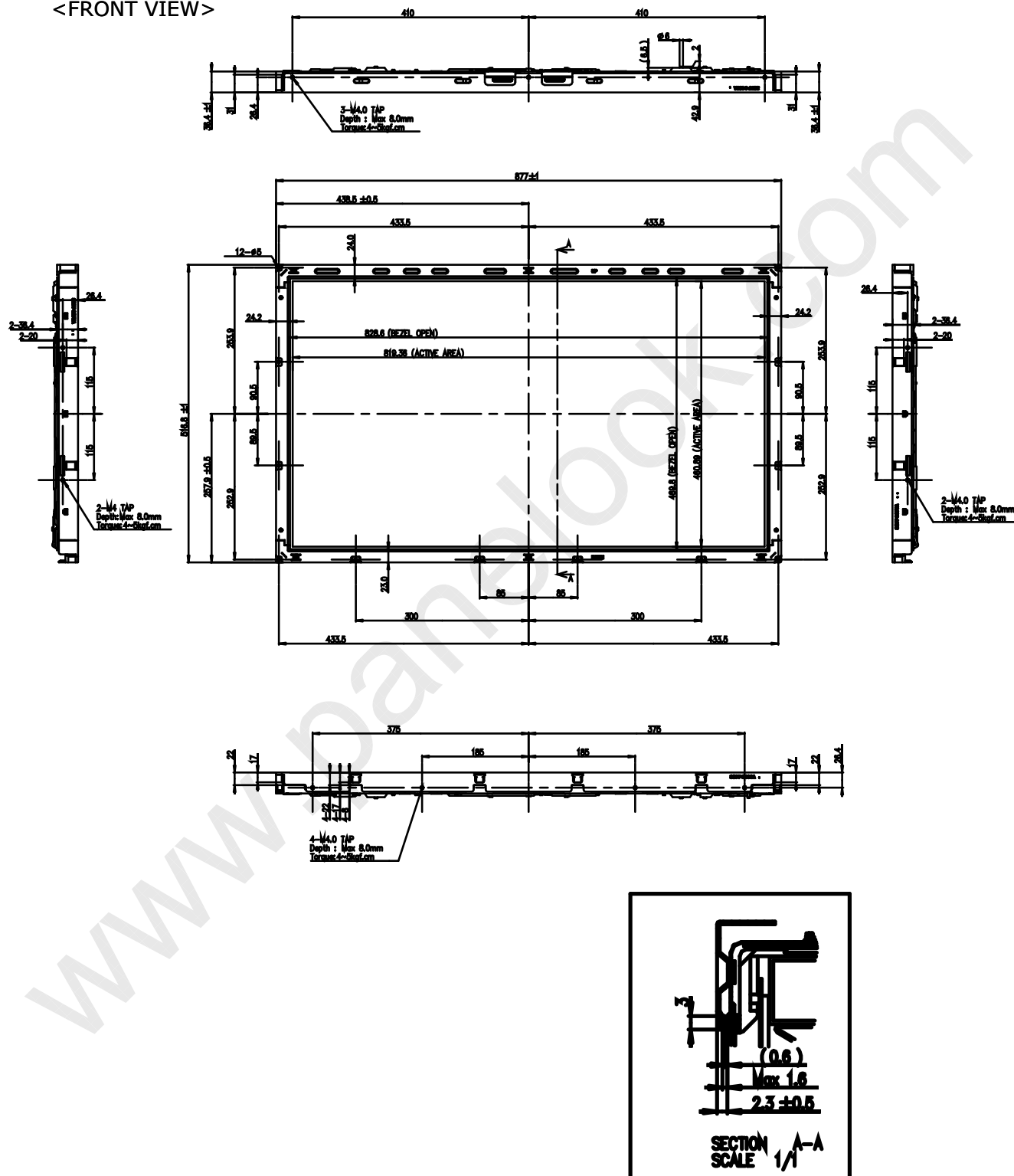
Item	Value	
Outline Dimension	Horizontal	877.0 mm
	Vertical	516.8 mm
	Depth	36.4 mm
Bezel Area	Horizontal	828.6 mm
	Vertical	469.8 mm
Active Display Area	Horizontal	819.36 mm
	Vertical	460.89 mm
Weight	7,400(Typ.)/ 7,700(Max)	

Note : Please refer to a mechanical drawing in terms of tolerance at the next page.

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Product Specification

<FRONT VIEW>



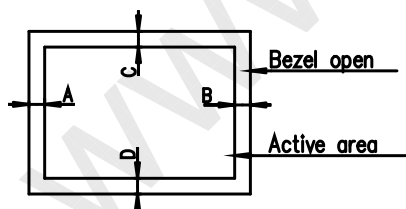
Ver. 1.0

25 / 38

[illegible]

NOTES

1. Unspecified tolerances are to be $\pm 0.5\text{mm}$.
2. This drawing is only preliminary data and can be changed without notice.
3. Tilt and partial disposition tolerance of display area is as following.
 - (1) X-Direction : $IA-BI \leq 1.5\text{mm}$
 - (2) Y-Direction : $IC-DI \leq 1.5\text{mm}$



4. IPB Wire Spec. : UL3239-HF VW-1, AWG#24(LS Cable) or compatible, Rating Voltage 6kV, UL File No. : E52853 or compatible
5. IPB Connector : UL94 V-0, BDEMR-02VS(JST) or compatible, UL File No. : E60389 or compatible
6. Shrink Tube : UL 94 V-1, NP-HF-Tube, AWG#6(N.PLASTECH) or compatible, UL File No. : E321606 or compatible



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6. Reliability

Table 10. ENVIRONMENT TEST CONDITION

No.	Test Item	Condition
1	High temperature storage test	Ta= 60°C 240h
2	Low temperature storage test	Ta= -20°C 240h
3	High temperature operation test	Ta= 50°C 50%RH 240h
4	Low temperature operation test	Ta= 0°C 240h
5	Vibration test (non-operating)	Wave form : random Vibration level : 1.0Grms Bandwidth : 10-300Hz Duration : X,Y,Z, One time each direction per 10min
6	Shock test (non-operating)	Shock level : 100Grms Waveform : half sine wave, 2ms Direction : ± X, ± Y, ± Z One time each direction
7	Humidity condition Operation	Ta= 40 °C ,90%RH
8	Altitude operating storage / shipment	0 - 15,000 ft 0 - 40,000 ft

Note : Before and after Reliability test, LCM should be operated with normal function.



LC370WUH

Product Specification

7. International Standards

7-1. Safety

- a) UL 60065, 7th Edition, dated June 30, 2003, Underwriters Laboratories, Inc., Standard for Audio, Video and Similar Electronic Apparatus.
- b) CAN/CSA C22.2, No. 60065:03, Canadian Standards Association, Standard for Audio, Video and Similar Electronic Apparatus.
- c) IEC60065:2001, 7th Edition CB-scheme and EN 60065:2002, Safety requirements for Audio, Video and Similar Electronic Apparatus..

7-2. Environment

- a) RoHS, Directive 2002/95/EC of the European Parliament and of the council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment



LC370WUH

Product Specification

8. Packing

8-1. Information of LCM Label

a) Lot Mark

A	B	C	D	E	F	G	H	I	J	K	L	M
---	---	---	---	---	---	---	---	---	---	---	---	---

A,B,C : SIZE(INCH)

E : MONTH

D : YEAR

F ~ M : SERIAL NO.

Note

1. YEAR

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Mark	1	2	3	4	5	6	7	8	9	0

2. MONTH

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mark	1	2	4	4	5	6	7	8	9	A	B	C

b) Location of Lot Mark

Serial NO. is printed on the label. The label is attached to the backside of the LCD module.
This is subject to change without prior notice.

8-2. Packing Form

a) Package quantity in one box : 4 pcs

b) Box Size : 968mm X 366mm X 595mm



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Product Specification

9. Precautions

Please pay attention to the followings when you use this TFT LCD module.

9-1. Mounting Precautions

- (1) You must mount a module using specified mounting holes (Details refer to the drawings).
- (2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- (3) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to resist external force.
- (4) You should adopt radiation structure to satisfy the temperature specification.
- (5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- (6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)
- (7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer. * There is no problem of Panel crack under 5kgf / $\phi 10\text{mm}$
- (8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- (9) Do not open the case because inside circuits do not have sufficient strength.

9-2. Operating Precautions

- (1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage : $V = \pm 200\text{mV}$ (Over and under shoot voltage)
- (2) Response time depends on the temperature. (In lower temperature, it becomes longer.)
- (3) Brightness depends on the temperature. (In lower temperature, it becomes lower.) And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer
- (4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- (5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
- (6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- (7) Please do not give any mechanical and/or acoustical impact to LCM. Otherwise, LCM can't be operated its full characteristics perfectly.
- (8) A screw which is fastened up the steels should be a machine screw. (if not, it can cause conductive particles and deal LCM a fatal blow)
- (9) Please do not set LCD on its edge.
- (10) Partial darkness may happen during 3~5 minutes when LCM is operated initially in condition that luminance is under 40% at low temperature (under 5°C). This phenomenon which disappears naturally after 3~5 minutes is not a problem about reliability but LCD characteristic



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Product Specification

9-3. Electrostatic Discharge Control

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

9-4. Precautions for Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

9-5. Storage

When storing modules as spares for a long time, the following precautions are necessary.

- (1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
- (2) The polarizer surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were shipped.

9-6. Handling Precautions for Protection Film

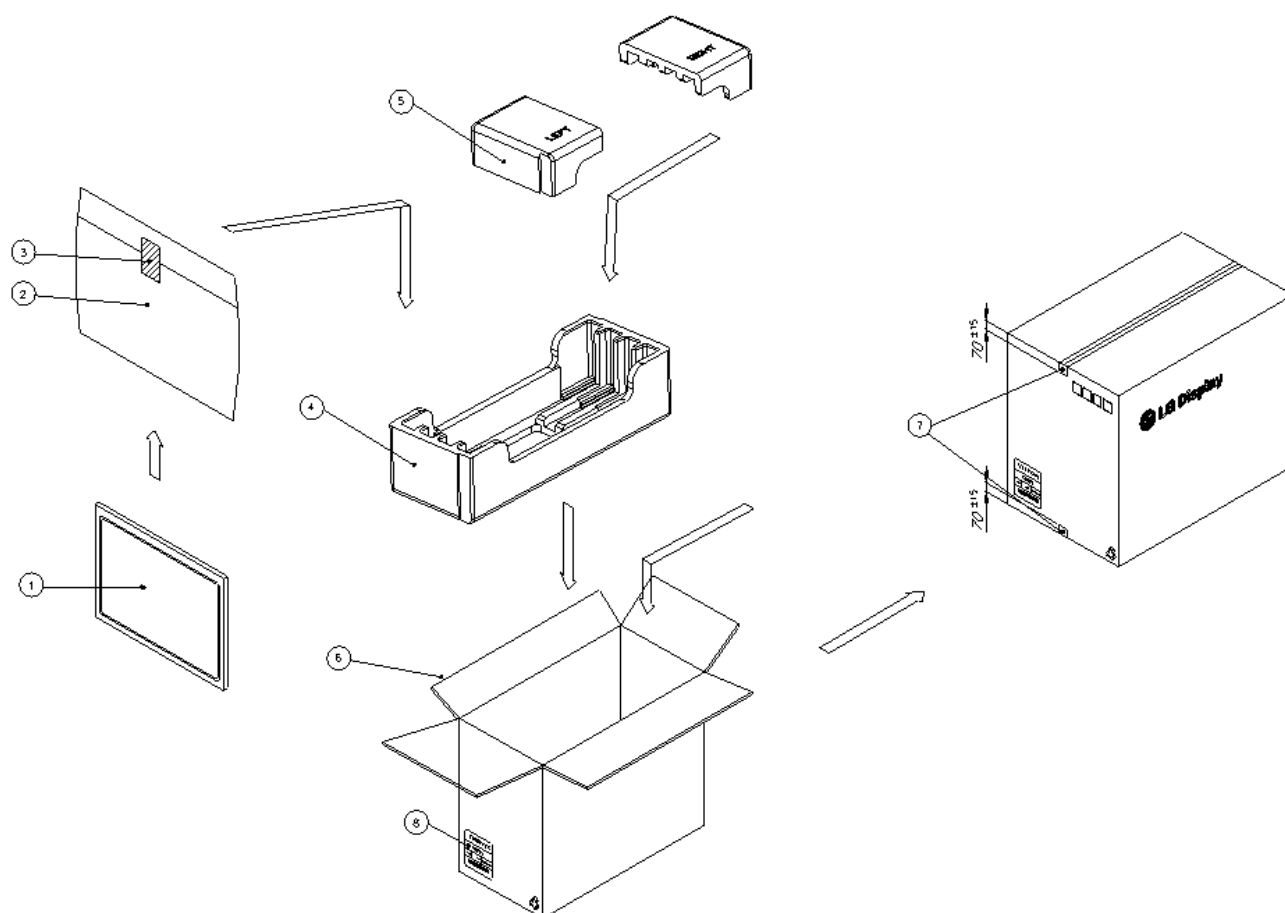
- (1) The protection film is attached to the bezel with a small masking tape.
When the protection film is peeled off, static electricity is generated between the film and polarizer.
This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
- (2) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the bezel after the protection film is peeled off.
- (3) You can remove the glue easily. When the glue remains on the bezel surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

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Product Specification

APPENDIX-I-1

■ LC370WUH-SBA1 Packing Ass'y

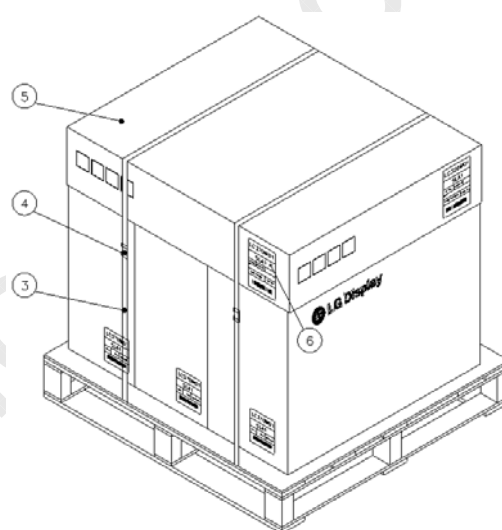
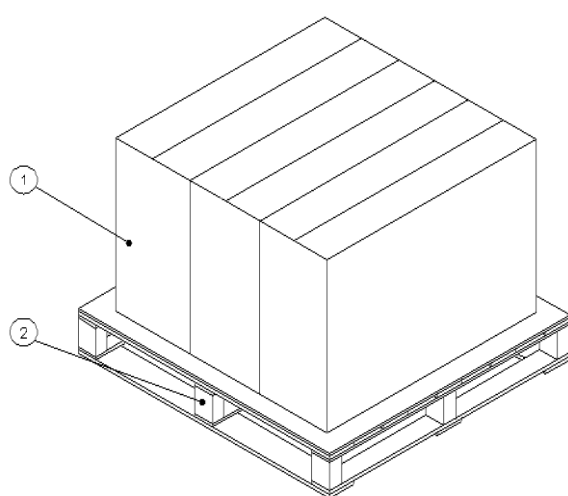


NO.	DESCRIPTION	MATERIAL
1	LCD MODULE	
2	BAG	AL
3	TAPE	MASKING 20MM X 50M
4	PACKING, BOTTOM	EPS
5	PACKING, TOP R_L	EPS
6	BOX	PAPER_DW3
7	TAPE	OPP 70MMX300M
8	LABEL	YUPO PAPER 100X100

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APPENDIX-I-2

■ LC370WUH-SBA1 Pallet Ass'y

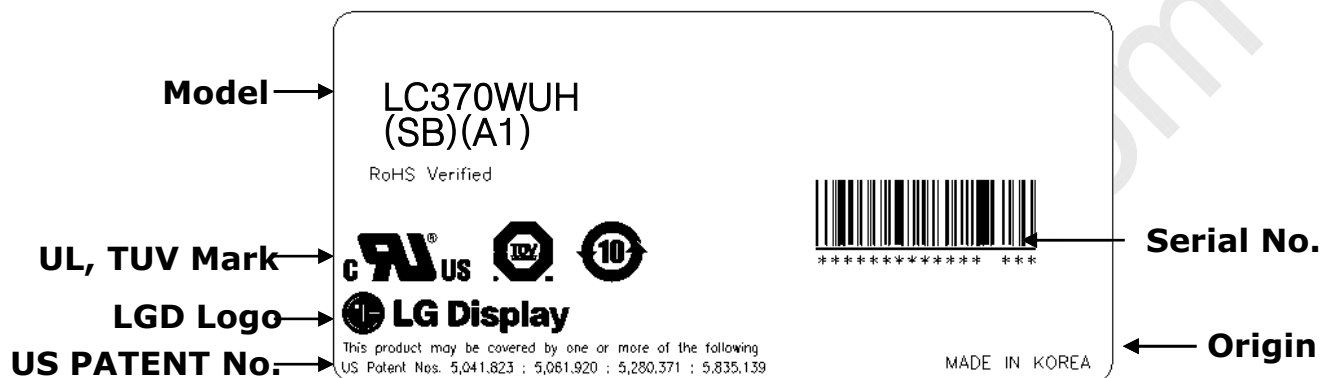


NO.	DESCRIPTION	MATERIAL
1	PACKING ASS'Y	
2	PALLET	Plywood_1140X990X130
3	BAND	PP
4	BAND, CLIP	CLIP 18MM
5	ANGLE, COVER	DW3
6	LABEL	YUPO PAPER

LC370WUH

APPENDIX- II

■ LCM Label





LC370WUH

APPENDIX-III

■ Box Label

LC370WUH		
SBA1		
4 PCS	LOT/MM-DD	
MADE IN KOREA		RoHS Verified
 *****		

■ Pallet Label

LC370WUH		
SBA1		
12 PCS	LOT/MM-DD	
MADE IN KOREA		RoHS Verified
 *****		

LC370WUH

Product Specification

APPENDIX IV. Gate and Source Control Signal timing

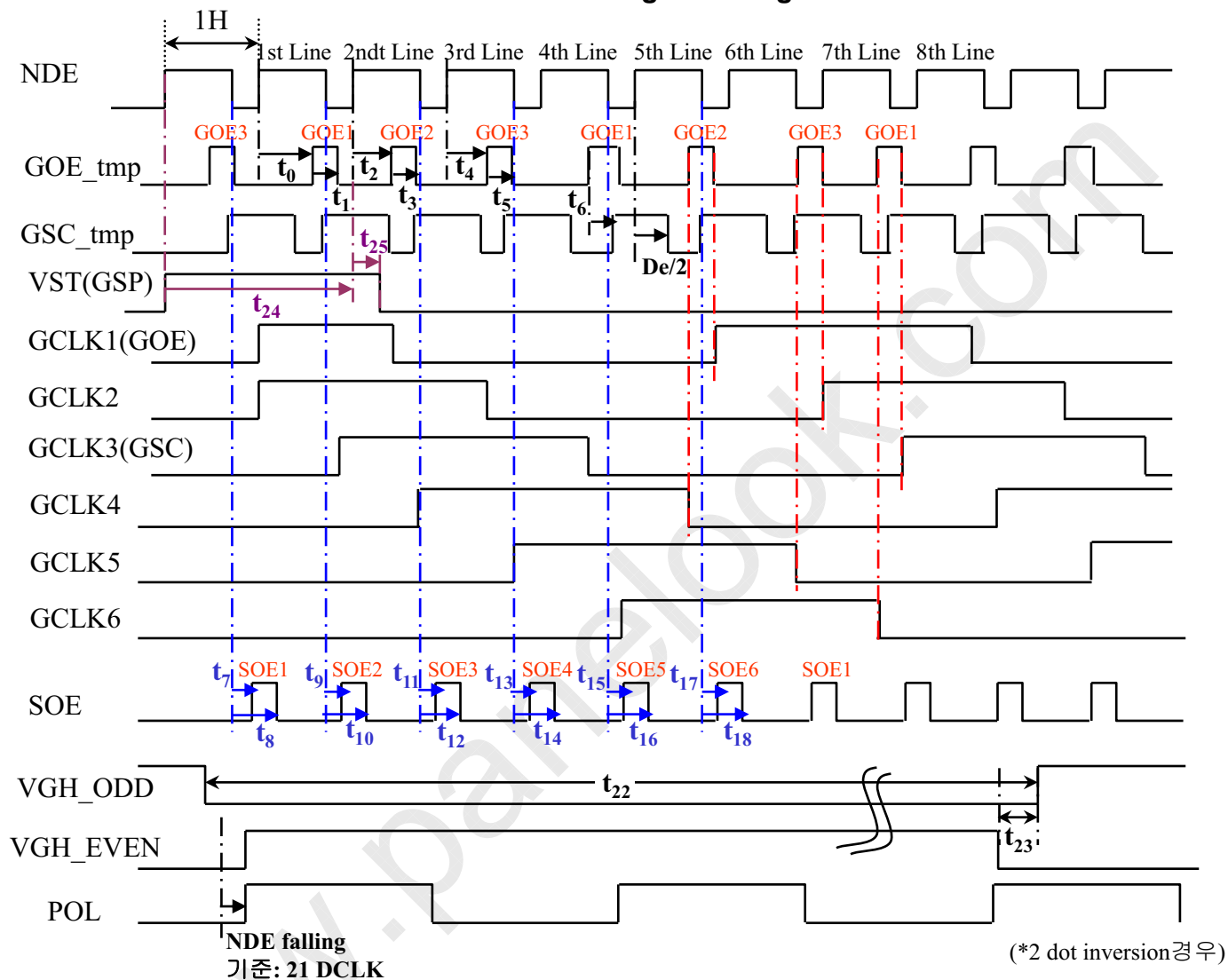


Table11. Timing table

Ta= 25±2°C, fv=120Hz, Dclk=297MHz, fH=135kHz

Parameter	Value			Unit	Notes
	Min	Typ	Max		
t1,t3,t5	-	140	-	t _{CLK}	
t0,t2,t4	-	387	-	t _{CLK}	
t7,t9,t11	-	10	-	t _{CLK}	
t8,t10,t12	-	56	-	t _{CLK}	
t22	-	254	-	frame	
t23	-	48	-	t _{CLK}	

Note : 1. Typical value of table11 is LG Recommend timing that base model use.

LC370WUH

Product Specification

APPENDIX- V

■ Starting (Striking) Voltage measurement method.

Measure the high voltage point of Balance Ass'y after removing all lamp.

a) CCFL Cap balance Structure

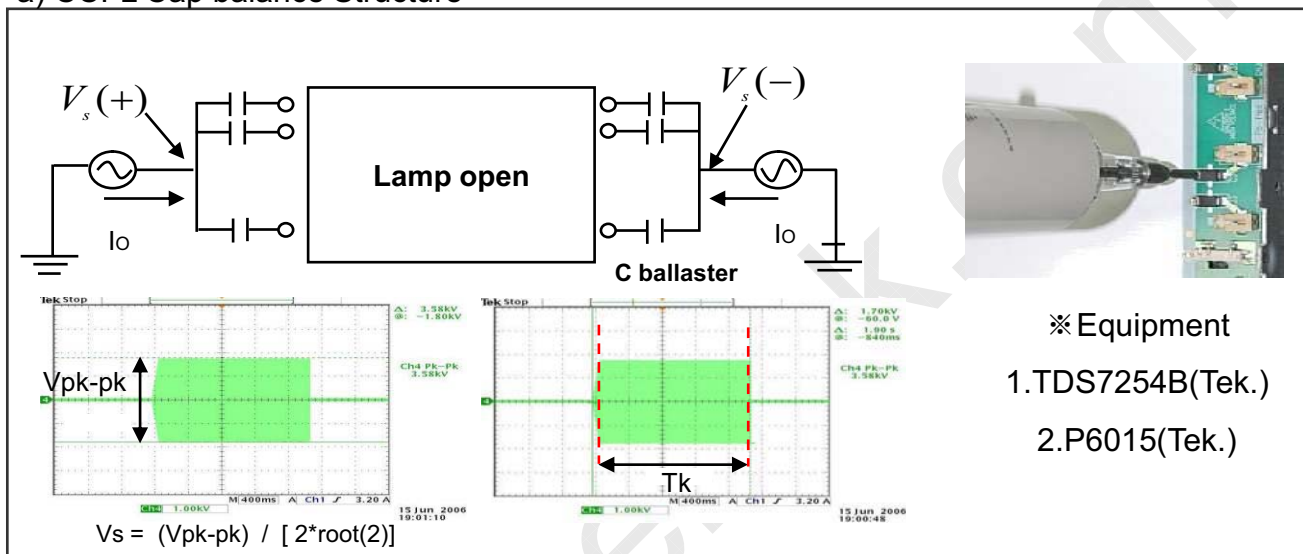


Figure 1 . CCFL Vopen

b) EEFL Structure

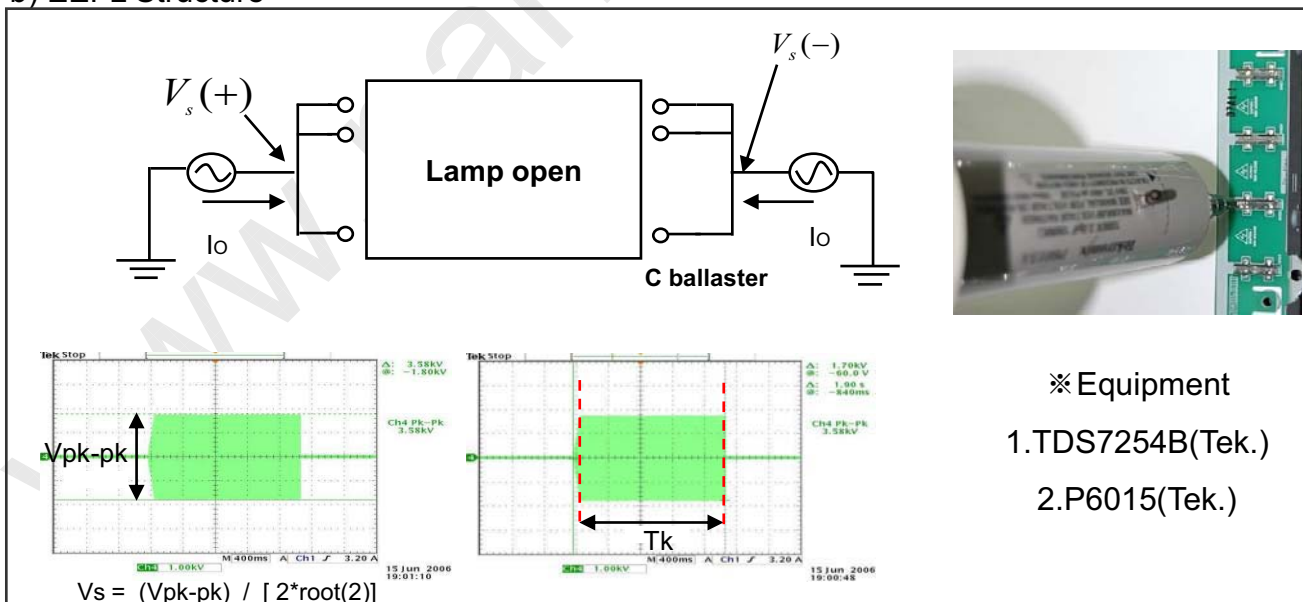


Figure 2 . EEFL Vopen



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Product Specification

APPENDIX- VI

■ Lamp Electrical spec

№	Item	Unit	Standards		Notes
			Frequency	INV(High-High)	
1	Lamp Voltage VL	Vrms	45kHz	1605±7% (IL=3.0mA) 1790±7% (IL=5.0mA) 2075±7% (IL=7.0mA) 2165±7% (IL=7.5mA) 2260±7% (IL=8.0mA)	Note1,3,10
2	Starting Voltage VS	Vrms	45kHz	Max 2240(0℃) Typ 1870(0℃) Max 1920(25℃) Typ 1600(25℃)	Note 10,11,12
3	Lamp Current IL	mA		Min 3.0 mA Typ 7.0 mA Max 8.0 mA	Note 1,3
4	Lamp Power IL × VL	W	45kHz	3.82 (IL=3.0mA) 5.55 (IL=5.0mA) 7.02 (IL=7.0mA) 7.12 (IL=7.5mA) 7.41 (IL=8.0mA)	Note 1,3
5	Average Luminance At Lamp Center L	Cd/m ²		13500±10% (IL=3.0mA) 20000±10% (IL=5.0mA) 25500±10% (IL=7.0mA) 26500±10% (IL=7.5mA) 27500±10% (IL=8.0mA)	Note 1,3,4
6	Effective Light Emitting Area LE	mm		Min 792	Note 1,3,9
8	Color Coordinates	x		0.247±0.01	Note1,3,4
		y		0.217±0.01	

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Product Specification

9	Peak spectrum (reference)	nm	Red 611 Green 543 Blue 450	
10	Discharge Stabilization Time	min	3	Note 3,6
11	Operating Frequency	kHz	40 ~ 45(Typ) ~80	Note 7
12	Life Time	Hours	Min 50,000 (at 8.0mA) Avg 60,000 (at 8.0mA)	7. Life
13	Lamp Surface Temperature	°C	Max 130(at Electrode) Min 70(at Center)	Note 1,3,8
14	Content of Mercury	mg	Min 2.0 Max 3.8	
15	Solder Dipping Quantity	%	Min 95	
16	Gas Pressure	Torr	(Typ)34±4	Note 3

Note 1) Started at IL=7.5(mA) and measure 3minutes later.

2) Voltage at switch on. Inverter output voltage.

3) Ambient Temperature should be 25±1°C under no wind.

4) The center/center part of lamp shall be measured.

5) Luminance uniformity is as follows.

Luminance uniformity = Min / Max × 100 (%)

Max = max luminance which is in the area of effective lighting length.

Min = min luminance which is in the area of effective lighting length.

6) The time needed to achieve not less than 95% luminance of the center / center part of lamp.

The center / center part of lamp shall be measured. The luminance of the lamp after lighted for 3minutes is defined as 100%.

7) The frequency range can be keep within ±10% range of electrical and optical characteristics(except the chromaticity).

8) This is temperature difference between high voltage electrode and low voltage electrode(except the lamp end to 30mm).

9) The measurement Inverter is limited to the Hi-Hi.

10) The measurement NF OSS33229 Hi-Hi Voltage Type.

11) The measurement Ids 4.0 Level and Vds 10.0 Level.(NF OSS3329)

12) Be measured of ambient 0°C . Before testing the lamp is left for 24hours

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Product Specification

APPENDIX- VII-1

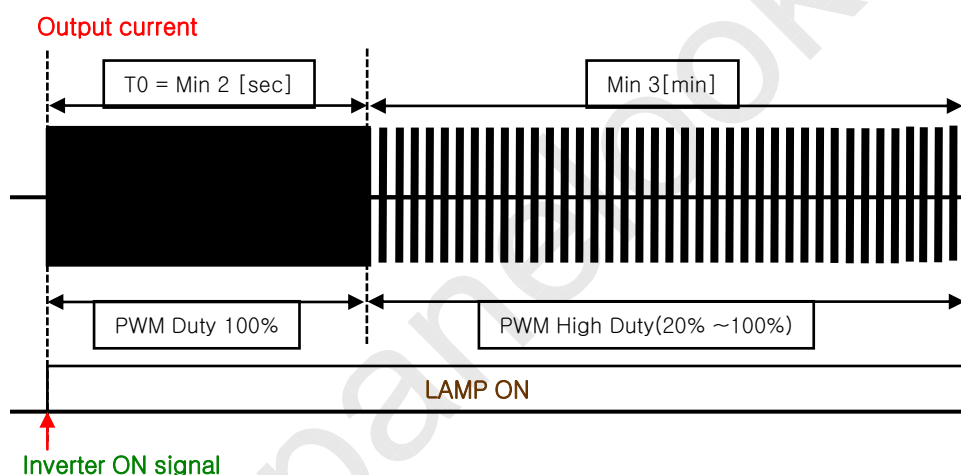
Mega DCR using condition(1)

- After Inverter ON signal, PWM Duty 100% should be sustained during 2sec.
- It is recommended not to sustain more than 10 min for Deep Dimming (Low duty of the inverter output current 0%~20%).

The deep dimming must be used very carefully due to limitation of lamp characteristics and specification.

1) For stable lamp on, its duty condition should follow below the condition.

After Inverter ON signal, T0 duration should be sustained.



2) Low duty(0%~20%) of the inverter output current, B/L may not satisfy some of LCM specification.

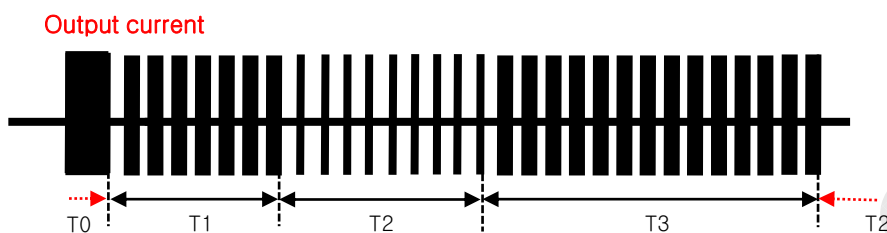
- Duration : the low duty operation(0 ~ 20%) must be limited within 10 minutes for one time operation.
- Ratio : the period of the low duty operation must be less than 1/5 compare to that of the high duty operation(20~100%) in a certain period to prevent unwanted operation.
- FOS : partial darkness or darkness of center area during the low duty might be happened due to insufficient lamp current.
- Warm up : the low duty must be used 3 min after the lamps "ON". In case of low temperature, more warm up time may be needed.

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Product Specification

APPENDIX- VII-2

Mega DCR using condition(2)



Parameter	Value			Unit	Note
	Min	Typ	Max		
T1	3	-	-	min	PWM High Duty[20~100%]
T2	-	-	10	min	PWM Low Duty[0~20%]
T3	T2 x 5	-	-	min	PWM High Duty[20~100%]

- 3) The output current duty may not be same as input PWM duty due to rise/fall time of output.
- 4) Following the recommended conditions as aforementioned, there is no difference of lamp lifetime between conventional method and new one.